

## Claims

What is claimed is:

1. A method of configuring a network interface card, comprising:  
instructing the network interface card to operate in a first mode when  
5 packets are received by the network interface card at less than a predefined  
rate, the network interface card in the first mode being capable of interrupting  
a CPU when a packet is received by the network interface card; and  
instructing the network interface card to operate in a second mode  
when packets are received by the network interface card at greater than a  
10 predefined rate, the network interface card in the second mode being disabled  
from interrupting the CPU when a packet is received by the network interface  
card.
2. A method of processing packets in a computer system including an  
15 operating system and a network interface card, comprising:  
polling the network interface card to determine whether one or more  
packets have been received when the network interface card is in a polling  
mode; and  
receiving an interrupt from the network interface card when the  
20 network interface card is in an interrupt mode, the interrupt indicating that the  
network interface card has received one or more packets.
3. The method as recited in claim 2, further comprising:

obtaining packets from the network interface card and processing the packets obtained from the network interface card.

4. The method as recited in claim 2, wherein the operating system is  
5 configured to instruct the network interface card to operate in the polling mode or the interrupt mode.

5. The method as recited in claim 2, further comprising:  
instructing the network interface card to operate in the polling mode  
10 when packets are being received frequently by the network interface card; and  
instructing the network interface card to operate in the interrupt mode  
when packets are being received infrequently by the network interface card.

15 6. The method as recited in claim 2, further comprising:  
instructing the network interface card to operate in the polling mode  
when a number of packets received per second by the network interface card is  
greater than a predefined number; and  
instructing the network interface card to operate in the interrupt mode  
20 when the number of packets received per second by the network interface card  
is less than the predefined number.

7. The method as recited in claim 2, wherein the computer system has one or more CPUs, and wherein the mode of the network interface card is established in association with one or more of the CPUs.

5 8. The method as recited in claim 2, the network interface card when in the interrupt mode being configured to interrupt the operating system when a packet is received by the network interface card over a network, the network interface card being unable to interrupt the operating system when in the polling mode, thereby enabling the operating system to poll the network  
10 interface card to obtain packets from the network interface card when the network interface card is in the polling mode.

9. The method as recited in claim 2, the network interface card when in  
15 the interrupt mode being configured to interrupt the operating system when a packet is received by the network interface card over a network, the network interface card being unable to interrupt the operating system when in the polling mode for packets having low priority and being able to interrupt the system when in the polling mode for packets having high priority, further  
20 comprising:

receiving an interrupt from the network interface card when the network interface card is in the polling mode when the network interface card has received one or more packets having a high priority.

10. The method as recited in claim 2, further comprising:  
ascertaining whether the network interface card is in an interrupt mode  
or a polling mode.

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11. The method as recited in claim 2, further comprising:  
placing the network interface card in the polling mode.

10 12. The method as recited in claim 2, further comprising:  
placing the network interface card in the interrupt mode.

13. The method as recited in claim 2, further comprising:  
initializing the network interface card such that the network interface  
15 card is in the interrupt mode.

14. The method as recited in claim 2, further comprising:  
instructing the network interface card to switch from the polling mode  
20 to the interrupt mode.

15. The method as recited in claim 14, wherein instructing the network  
interface card to switch from the polling mode to the interrupt mode comprises

instructing the network interface card to switch from the polling mode to the interrupt mode for a specified period of time.

5 16. The method as recited in claim 2, further comprising:

instructing the network interface card to switch from the interrupt mode to the polling mode.

10 17. The method as recited in claim 16, wherein instructing the network interface card to switch from the interrupt mode to the polling mode comprises instructing the network interface card to switch from the interrupt mode to the polling mode for a specified period of time.

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18. The method as recited in claim 2, wherein the computer system further includes a CPU, the CPU having an associated queue, the network interface card having an associated buffer, the method further comprising:

20 if it is determined that one or more packets have been received by the network interface card, transferring the one or more packets from the buffer associated with the network interface card to the queue associated with the CPU and processing each of the packets in the queue associated with the CPU.

19. The method as recited in claim 2, wherein the computer system further includes a CPU, the CPU having an associated queue, the network interface card having an associated buffer, the method further comprising:

when an interrupt is received from the network interface card,  
5 transferring a set of one or more packets from the buffer associated with the network interface card to the queue associated with the CPU.

20. The method as recited in claim 19, wherein the set of packets are  
10 transferred simultaneously.

21. The method as recited in claim 19, further comprising:  
instructing the network interface card to switch from the polling mode  
to the interrupt mode when no packets are in the queue associated with the  
15 CPU or the buffer associated with the network interface card.

22. The method as recited in claim 19, further comprising:  
instructing the network interface card to switch from the interrupt  
mode to the polling mode when the interrupt is received from the network  
20 interface card.

23. The method as recited in claim 19, further comprising:  
processing each of the packets in the queue.

24. The method as recited in claim 23, wherein each of the packets in the queue is inbound or outbound.

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25. The method as recited in claim 23, wherein each of the packets in the queue corresponds to one or more network connections.

10 26. The method as recited in claim 23, further comprising:  
instructing the network interface card to switch from the interrupt mode to the polling mode prior to processing each of the packets in the queue.

27. The method as recited in claim 23, further comprising:  
15 instructing the network interface card to switch from the interrupt mode to the polling mode.

28. The method as recited in claim 27, further comprising:  
20 after processing each of the packets in the queue, polling the network interface card to determine if one or more packets have been received by the network interface card in the buffer associated therewith; and  
if one or more packets have been received by the network interface card, transferring the one or more packets from the buffer associated with the

network interface card to the queue associated with the CPU and processing each of the packets in the queue associated with the CPU.

29. The method as recited in claim 28, further comprising:

5 if no more packets have been received by the network interface card, instructing the network interface card to switch from the polling mode to the interrupt mode.

10 30. The method as recited in claim 27, further comprising:

instructing the network interface card to switch from the polling mode to the interrupt mode after processing each of the packets in the queue.

15 31. The method as recited in claim 23, further comprising:

instructing the network interface card to switch from the polling mode to the interrupt mode after processing each of the packets in the queue.

20 32. The method as recited in claim 19, further comprising:

instantiating a worker thread for processing packets in the queue associated with the CPU.



33. The method as recited in claim 32, wherein the worker thread or a second worker thread is responsible for transferring the set of packets from the buffer associated with the network interface card to the queue associated with the CPU.

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34. The method as recited in claim 32, wherein the worker thread is responsible for instructing the network interface card to switch from polling mode to interrupt mode when no packets are in the queue associated with the CPU or the buffer associated with the network interface card.

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35. The method as recited in claim 32, wherein the worker thread is responsible for instructing the network interface card to switch from the interrupt mode to the polling mode after an interrupt is received from the network interface card.

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36. The method as recited in claim 2, further comprising:  
20 assigning an identifier to map one of a set of one or more CPUs in the computer system to one of a set of one or more network interface cards.

37. The method as recited in claim 36, further comprising:

instructing the network interface card identified by the identifier to enter the polling mode.

38. The method as recited in claim 36, further comprising:

5       instructing the network interface card identified by the identifier to enter the interrupt mode.

39. The method as recited in claim 36, wherein the interrupt includes the  
10       identifier.

40. The method as recited in claim 36, wherein the identifier is further associated with a queue associated with the CPU and a buffer associated with the network interface card.

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41. The method as recited in claim 40, wherein the interrupt includes the identifier.

42. The method as recited in claim 40, further comprising:

20       instructing the network interface card identified by the identifier to switch from the polling mode to the interrupt mode.

43. The method as recited in claim 40, further comprising:

instructing the network interface card identified by the identifier to switch from the interrupt mode to the polling mode.

5     44.     The method as recited in claim 2, further comprising:

instructing the network interface card to operate in the polling mode when a network packet that is received or to be transmitted is already being processed and one or more packets are queued; and

10     instructing the network interface card to operate in the interrupt mode when there are no queued packets.

45.     A computer system, comprising:

an operating system; and

15     a network interface card coupled to the operating system, the network interface card being configured to operate in an interrupt mode when in a first state and to operate in polling mode when in a second state, the network interface card when in the interrupt mode being configured to interrupt the operating system when a packet is received by the network interface card over  
20     a network.

46.     The computer system as recited in claim 45, the network interface card being unable to interrupt the operating system when in the polling mode, thereby enabling the operating system to poll the network interface card to

obtain packets from the network interface card when the network interface card is in the polling mode.

47. The computer system as recited in claim 45, the network interface card  
5 being unable to interrupt the operating system when in the polling mode for packets having low priority and being able to interrupt the system when in the polling mode for packets having high priority.

10 48. The computer system as recited in claim 45, further comprising:  
one or more CPUs.

49. The computer system as recited in claim 48, wherein the network  
interface card is mapped to one of the CPUS.

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50. The computer system as recited in claim 49, wherein the network  
interface card is further mapped to a queue associated with the one of the  
CPUs, wherein the queue is adapted for storing inbound and outbound  
packets.

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51. The computer system as recited in claim 45, further comprising:  
means for instructing the network interface card to switch from the  
interrupt mode to the polling mode; and

means for instructing the network interface card to switch from the polling mode to the interrupt mode.

52. The computer system as recited in claim 45, further comprising:

5 a driver including a call interface between a kernel of the operating system and the network interface card, the call interface enabling the kernel of the operating system to instruct the network interface card to enter the interrupt mode or the polling mode.

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53. An apparatus for processing packets in a computer system including an operating system and a network interface card, comprising:

means for polling the network interface card to determine whether one or more packets have been received when the network interface card is in a  
15 polling mode; and

means for receiving an interrupt from the network interface card when the network interface card is in an interrupt mode, the interrupt indicating that the network interface card has received one or more packets.

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54. The apparatus as recited in claim 53, further comprising:

means for instructing the network interface card to switch from the interrupt mode to the polling mode; and

means for instructing the network interface card to switch from the polling mode to the interrupt mode.

55. The apparatus as recited in claim 53, the network interface card when  
in the interrupt mode being configured to interrupt the operating system when  
5 a packet is received by the network interface card over a network, the network  
interface card being unable to interrupt the operating system when in the  
polling mode, thereby enabling the operating system to poll the network  
interface card to obtain packets from the network interface card when the  
network interface card is in the polling mode.

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56. The apparatus as recited in claim 53, the network interface card when  
in the interrupt mode being configured to interrupt the operating system when  
a packet is received by the network interface card over a network, the network  
interface card being unable to interrupt the operating system when in the  
polling mode for packets having low priority and being able to interrupt the  
15 system when in the polling mode for packets having high priority.

57. A computer-readable medium storing thereon computer readable  
20 instructions for processing packets in a computer system including an  
operating system and a network interface card, comprising:

instructions for polling the network interface card to determine  
whether one or more packets have been received when the network interface  
card is in a polling mode; and

instructions for receiving an interrupt from the network interface card when the network interface card is in an interrupt mode, the interrupt indicating that the network interface card has received one or more packets.

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58. The computer-readable medium as recited in claim 57, further comprising:

instructions for instructing the network interface card to switch from the interrupt mode to the polling mode; and

10 instructions for instructing the network interface card to switch from the polling mode to the interrupt mode.

59. The computer-readable medium as recited in claim 57, the network interface card when in the interrupt mode being configured to interrupt the operating system when a packet is received by the network interface card over  
15 a network, the network interface card being unable to interrupt the operating system when in the polling mode, thereby enabling the operating system to poll the network interface card to obtain packets from the network interface card when the network interface card is in the polling mode.

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60. The computer-readable medium as recited in claim 57, the network interface card when in the interrupt mode being configured to interrupt the operating system when a packet is received by the network interface card over a network, the network interface card being unable to interrupt the operating

system when in the polling mode for packets having low priority and being able to interrupt the system when in the polling mode for packets having high priority.

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61. A computer-readable medium storing thereon computer-readable instructions for configuring a network interface card, comprising:

instructions for instructing the network interface card to operate in a first mode when packets are received by the network interface card at less than  
10 a predefined rate, the network interface card in the first mode being capable of interrupting a CPU when a packet is received by the network interface card; and

instructions for instructing the network interface card to operate in a second mode when packets are received by the network interface card at  
15 greater than a predefined rate, the network interface card in the second mode being disabled from interrupting the CPU when a packet is received by the network interface card.

20 62. An apparatus for configuring a network interface card, comprising:

means for instructing the network interface card to operate in a first mode when packets are received by the network interface card at less than a predefined rate, the network interface card in the first mode being capable of



interrupting a CPU when a packet is received by the network interface card;  
and

means for instructing the network interface card to operate in a second mode when packets are received by the network interface card at greater than a predefined rate, the network interface card in the second mode being disabled  
5 from interrupting the CPU when a packet is received by the network interface card.

63. An apparatus for configuring a network interface card, comprising:  
10 a processor; and  
a memory, at least one of the processor and the memory being adapted for:

instructing the network interface card to operate in a first mode when packets are received by the network interface card at less than a predefined  
15 rate, the network interface card in the first mode being capable of interrupting a CPU when a packet is received by the network interface card; and

instructing the network interface card to operate in a second mode when packets are received by the network interface card at greater than a predefined rate, the network interface card in the second mode being disabled  
20 from interrupting the CPU when a packet is received by the network interface card.